Advanced Decision Making for Flexible and Adaptive Software Systems

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Self-Adaption

During lifetime, systems encounter different users and environments. Self-adaptive systems change behavior and configuration without human assistance to perform better.

Flexible Software

Today's software can be rapidly changed. This flexibility reduces user insight into the system abilities. We suggest to support users by offering configurations by multi-objective optimization.

Self-Adaptive Guardian: Demonstrating Utility-based Self-Adaptation

Questions to be answered by the system:

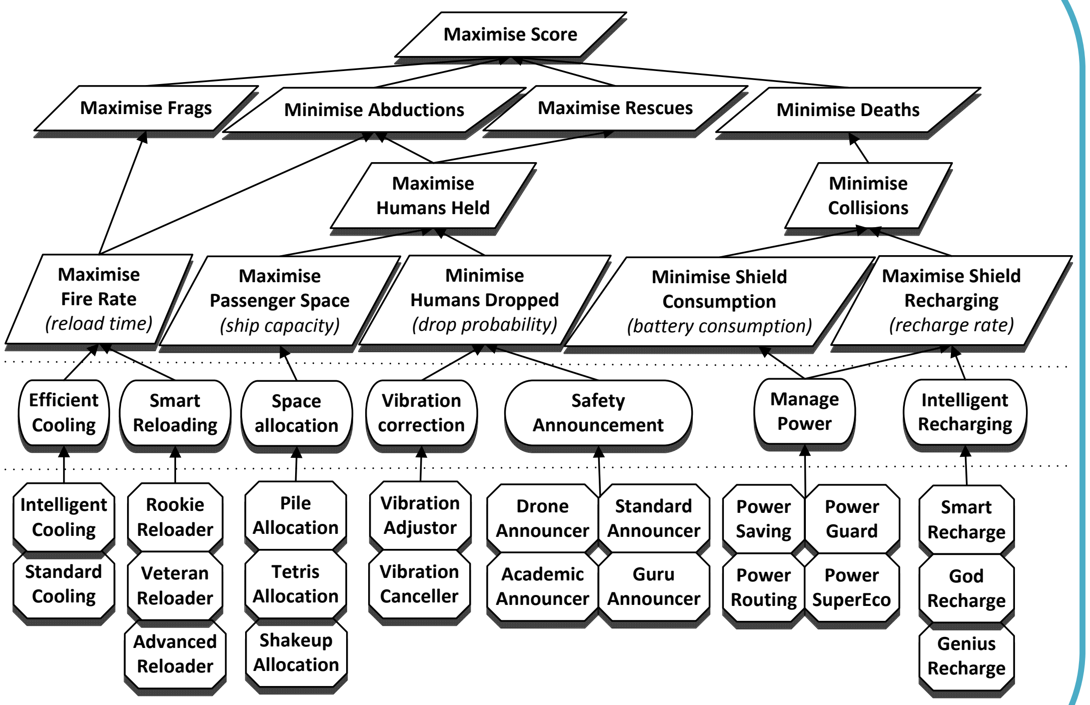
1. What is a good configuration situation?
2. How to achieve this configuration?

Modeling approach:

1. Combines Goal Oriented Design and Decision Analysis Process (DAP)
2. Utility functions are defined for several situations
3. Reconfiguration decisions maximize utility

Demonstration System Self-Adaptive Guardian:

- Enables experience of self-adaptation
- Full control over environment in the game
- Experiments with human users easily conducted



Hierarchical Model from Goal Oriented Design and DAP

Self-Healing Automotive Software System

- Modern cars are software intensive systems
- Standardization facilitates reconfiguration
- Reconfiguration enables self-healing
- Partners: Augsburg and Paderborn

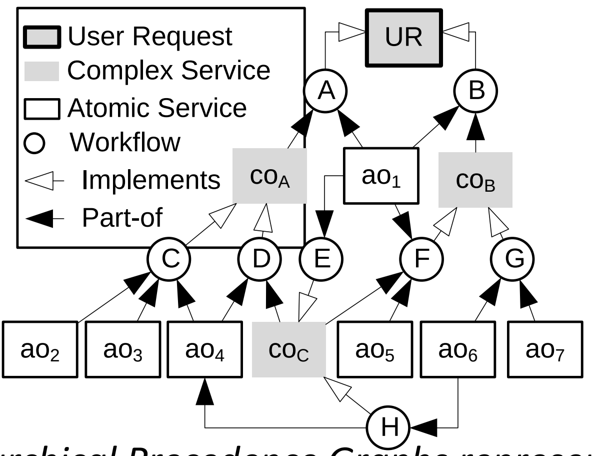
Specification (University Augsburg):
- Organic Design Pattern
- Constraints for functional correct configurations

Decision Making (Honiden Lab):
- PDDL Planning Domain
- Functionality preserving reconfiguration plans

Reconfiguration (University Paderborn):
- AUTOSAR Standard
- Reconfiguring Embedded Systems

MOO for flexible Processes

- Flexible software offers various processes to for user requests – selection is an issue
- Specifying preference with knowing alternatives is very difficult
- Multi-objective optimization can identify relevant process alternatives



Hierarchical Precedence Graphs representing alternative workflows and processes

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